

### **Appendix C**

#### **A clean copy of the amended specification**

- [0009] The invention, therefore, according to one aspect provides an operations,  
5 management, capacity, and services (OMCS) tool for assessing business solutions comprising alternative network architectures and management processes for a telecommunications network. The OMCS tool comprises modules for receiving data and options for plurality of network architectures and management processes; and for engineering the plurality of network architectures and the management processes. The  
10 management processes comprise network management processes and service and customer management processes for managing the plurality of network architectures. The OMCS tool comprises modules for determining suppliers' equipment and management processes costs for the plurality of network architectures, the network management processes, and the service and customer management processes. The  
15 OMCS tool also comprises modules for determining, based on the costs of the plurality of network architectures and the management processes, business parameters for the business solutions; and for storing and displaying the business parameters for the business solutions for the telecommunications network.
- 20 [0010] The business parameters comprise total expenditure; and wherein the total expenditure comprises capital expenditure (CAPEX) and operational expenditure (OPEX). The CAPEX comprises a network architecture cost; taxes; interests; and depreciation and amortization (D/A) expenses. The OPEX comprises a management processes cost; a leasing cost; and sales, general and administration (SG&A)  
25 expenses.
- [0011] The business parameters further comprise financial statistics including revenue; capacity; return on investment (ROI); earnings before interest, taxes, and depreciation and amortization (EBITDA); earnings before interest and taxes (EBIT);  
30 OPEX as percentage of revenue; and total expenditure as percentage of revenue.
- [0012] The OMCS tool comprises modules for receiving traffic data; customer

- data; and financial and labor data; and for receiving technology options which comprise one or more of the following technology: TDM, ATM, FR, IP, VPN, MPLS, and optical Ethernet including fiber, synchronous optical network (SONET), resilience packet ring (RPR), and dense wavelength division multiplexing (DWDM),
- 5 for a network architecture for a business solution. The OMCS tool further comprises modules for receiving management processes options for the network management processes and the service and customer management processes for managing the network architecture for the business solution.
- 10 [0013] The OMCS tool comprises modules for validating and calibrating the received data and options and the costs for the plurality of network architectures and the management processes for the business solutions.
- [0014] The OMCS tool further comprises modules for engineering the network
- 15 architecture for the business solution; and determining a network architecture cost and a leasing cost for the network architecture for the business solution.
- [0015] The module for engineering the network architecture comprises modules for determining an owned network elements (NEs) count; a leased NEs count; an
- 20 owned customer premise equipment (CPE) count; a leased CPE count; an owned links count; a leased links count; and a leased ports count. The network architecture comprises NEs, CPE, and links from the same or different equipment suppliers.
- [0016] The module for determining the network architecture cost comprises
- 25 modules for determining an owned cost (a price) per network element (NE), a footprint per NE cost, a power consumption per NE cost; an owned cost (a price) per CPE, a footprint per CPE cost, a power consumption per CPE cost; an owned cost (a price) per link and a link transmission rate.
- 30 [0017] The module for determining the network architecture cost further comprises modules for computing a total owned NEs cost; a total owned CPE cost; and a total owned links cost for the network architecture for the business solution.

- [0018] The module for determining the leasing cost further comprises modules for determining a leased per NE cost, a footprint per NE cost, a power consumption per NE cost; a leased per CPE cost, a footprint per CPE cost, a power consumption per CPE cost; a leased per link cost; a leased link per unit length cost, a unit length per link count, and a link transmission rate; and a leased per port cost. This module further comprises modules for computing a total leased NE's cost; a total leased CPE cost; a total footprints cost and a total power consumptions cost for the NEs and CPE; a total leased links cost; a total leased links per unit length cost; and a total leased ports cost for the network architecture for the business solution.
- [0019] The OMCS tool comprises module for engineering the management processes for network management processes; and service and customer management processes, which have management processes from the same or different management processes suppliers for managing the network architecture for the business solution. The tool also comprises module for determining a management processes cost which comprises a network management processes cost and a service and customer management processes cost.
- [0020] The module for engineering the network management processes comprises modules for engineering one or more of the following processes: inside plant maintenance; outside plant maintenance; network engineering; network provisioning; installation; testing; and repairs.
- [0021] The module for engineering the service and customer management processes comprises modules for engineering one or more of the following processes: customer relationship management (CRM); work order management (WOM); network inventory management (NIM); service activation and provisioning (SAP); fault management (FM); performance management (PM); accounting and billing; and security management.
- [0022] The module for determining the network management processes cost

comprises modules for determining the network management processes cost based on whether the operations of each of the network management processes is performed using one or more of the following: a manual operations mode; a mechanized operations mode; and a manual and mechanized operations mode. The module for  
5 determining the service and customer management processes cost comprises modules for determining the service and customer management processes cost based on whether the operations of each of the service and customer management processes is performed using one or more of the following: a manual operations mode; a mechanized operations mode; and a manual and mechanized operations mode.

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[0023] Another aspect of the invention provides a computer program containing instructions for directing a computer to perform a process for assessing business solutions comprising alternative network architectures and management processes for a telecommunications network.

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[0024] The program contains instructions for causing the computer to receive traffic data, customer data, and financial and labor data; technology options, which comprise at least one of the following technology: TDM, ATM, FR, IP, VPN, MPLS, and optical Ethernet including fiber, SONET, RPR, and DWDM, for a network  
20 architecture for a business solution; and management processes options for the network management processes and service and customer management processes for managing the network architecture for the business solution.

[0025] The program contains instructions for causing the computer to engineer the  
25 network architecture for the business solution; and compute a network architecture cost and a leasing cost for the network architecture for the business solution.

[0026] The program contains instructions for causing the computer to engineer at least one of the following network management processes: inside plant maintenance, outside plant maintenance, network engineering, network provisioning, installation, testing, and repairs; and engineer at least one of the following service and customer management processes: CRM, WOM, NIM, SAP, FM, PM, accounting and billing,  
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and security management, for managing the network architecture for the business solution. The program also contains instructions for computing a management processes cost, which comprises a network management processes cost and a service and customer management processes cost for the network, service and customer management processes based on whether the operations of each of these management processes is performed manually, using mechanized systems (i.e., operations support systems (OSS)) or both based on the Service Provider operating environment.

[0027] The program contains instructions for causing the computer to compute the business parameters for the business solutions over a pre-determined study period; and store and display in tables and graphical charts the business parameters for the business solutions over the predetermined study period.

[0028] In accordance with a first embodiment of this invention, the program is a self-contained Microsoft EXCEL-based decision support software tool comprises a plurality of EXCEL workbooks. A number of EXCEL workbooks are for receiving data and options for plurality of network architectures and management processes for the business solutions; and others for engineering the network architectures and the management processes and determining their costs. Other workbooks are for determining, storing, and displaying the business parameters for the business solutions for the telecommunications network.

[0029] In accordance with a second embodiment of this invention, the program is a self-contained software tool comprises a plurality of sub-programs linked together and the sub-programs are written in one or more of the following computer languages: machine language, C/C++, virtual basic, and Java. A number of sub-programs are for receiving data and options for plurality of network architectures and management processes for the business solutions; and others for engineering the network architectures and the management processes and determining their costs. Other sub-programs are for determining, storing, and displaying the business parameters for the business solutions for the telecommunications network.

[0030] A further aspect of the invention provides a method for assessing business solutions comprising alternative network architectures and management processes for a telecommunications network. The method comprises the steps of instructing a  
5 computer to receive data and options for plurality of network architectures and management processes; engineer a plurality of network architectures and management processes; determine suppliers' equipment and management processes costs; determine, based on the costs of the plurality of network architectures and the management processes, business parameters for the business solutions; and store and  
10 display the business parameters for the business solutions for the telecommunications network.

[0036] This invention provides an operations, management, capacity, and services (OMCS) tool and method for assessing business solution for a telecommunications  
15 network. The business solution comprises plurality of network architectures having various technologies and management processes for managing the plurality of network architectures. The management processes replicate today's operations and management networks for Service Providers; and the management processes cost is determined based on whether the operations of these management processes is  
20 performed manually, using mechanized systems (i.e., OSS) or both based on the Service Provider operating environment. The OMCS tool automates the calculation of the business parameters for the business solution and enables the Service Provider to compare technology alternatives for the network architectures for the business solutions. The OMCS tool provides a comprehensive view of the business solution for  
25 the telecommunications network that enables the Service Provider to quantify the savings of one business solution versus another and identifies the areas for cost reduction.

[0037] Advantageously, the costs for managing and operating the network  
30 architecture are integrated with the cost of the network architecture in the total cost of the business solution and the Service Provider would be able to identify the areas for enhancing or reducing the management and operating cost of the telecommunications

network. Reducing the management and operating cost of a telecommunications network is critical to the survival of the Service Provider. The embodiments of the present invention provide improved software tools and methods for business solution for a telecommunications network that would overcome the shortcomings and

5 limitations of the prior arts.

[0061] The input user data 110 module enables an analyst to input user data and options for a plurality of network architectures to be modeled. The input user data comprises traffic data; customer data; and financial and labor data. The options enable  
10 the analyst to select technology alternatives for network architectures and management processes for business solutions for a telecommunications network.

[0067] The business parameters comprise total expenditure, wherein the total expenditure comprises capital expenditure (CAPEX) and operational expenditure  
15 (OPEX). The CAPEX comprises a network architecture cost, taxes, interests, and depreciation and amortization (D/A) expenses; and the OPEX comprises a management processes cost; a leasing cost; and sales, general and administration (SG&A) expenses.

[0068] The business parameters further comprise financial and business statistics comprising revenue; capacity; return on investment (ROI); earnings before interest, taxes, and depreciation and amortization (EBITDA); earnings before interest and taxes (EBIT); OPEX as percentage of revenue; and total expenditure as percentage of  
20 revenue.

[0069] The reporting business solutions 170 module reports in tables and graphical charts the business parameters for the business solutions over said pre-determined study period.

[0087] The ARCH1 520 having switching nodes 521 and services nodes 522 from supplier A 501; add/drop nodes 523 and cross-connect nodes 524 from supplier B 502; and other nodes 525 from supplier C 503. The ARCH2 530 having switching  
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nodes 531 and services nodes 532 from supplier A 504; add/drop nodes 533 and cross-connect nodes 534 from supplier B 505; and other nodes 535 from supplier C 506. The ARCH3 540 having switching nodes 541 and services nodes 542 from supplier A 507; add/drop nodes 543 and cross-connect nodes 544 from supplier B 508; and other nodes 545 from supplier C 509.

[0094] A total footprints cost 675 is determined by multiplying the sum of the owned CPE count 650 and the leased CPE count 663 by the footprint per CPE cost 670. A total owned CPE cost 660 is determined by multiplying the owned CPE count 650 by the price per CPE 655. A total leased CPE cost 680 is determined by multiplying the leased CPE count 663 by the leased per CPE cost 665. A total power consumptions cost 690 is determined by multiplying the sum of the owned CPE count 650 and the leased CPE count 663 by the power consumption per CPE cost 685.

[0097] The ARCH1 720 having T1 721 and T3 722 links from supplier A 701; E1 723 and E3 724 links from supplier B 702; and DSL links 725, 10/100 BT 726, and 100/1000 BT 727 links from supplier C 703. The ARCH2 730 having fiber 100FX 731 from supplier A 704; OC3 732, OC12 733, OC48 734, and OC 192 links 735 from supplier B 705; and DWDM ring 736, RPR ring 737, and 1000SX/1000LX 738 from supplier C 706. The ARCH3 740 having SONET ring 741 and microwave 742 links from supplier A 707; fiber 100 FX 743 and 100/1000 BT 744 links from supplier B 708; and DSL 745 and T3 746 links from supplier C 709.

[0151] Procedure 1700 adjusts and updates data (block 1780) as required and re-analyzes the business parameters (block 1740). When analysis is completed for the pre-determined study period, procedure 1700 reports the business parameters for said network architectures over the pre-determined study period. The reporting of said business parameters comprises tabulating and graphically charting the business parameters (block 1790) for each of the network architectures over said pre-determined study period, thus, finishing the procedure 1700 (block 1795).



[0168] Figure 21 shows an illustrative graphical output from an execution of the OMCS tool of Figure 1. The graph 2100 plots dollars per Mbps 2110 over five years study period 2120, year0, year1, year2, year3, and year4 for five network architectures ARCH1 2130, ARCH2 2135, ARCH3 2140, ARCH4 2145, and ARCH5 2150. The five architectures represent the five different technologies described in Figure 18 above. In graph 2100 it can be seen that the return on investment for ARCH5 2050 is higher than the other architectures.

[0169] The embodiments of this invention provide a software tool that automates the calculation of business parameters for business solutions for a telecommunications network. A user of the OMCS tool is able to select, engineer, and cost plurality of network architectures having various technologies and different network, service, and customer management processes for a telecommunications network. The management processes replicate today's operations and management networks for Service Providers. The network architectures comprise NEs, CPE, and links from the same or different equipment suppliers, and have network, service, and customer management processes from the same or different management processes suppliers.

#### Abstract of the Invention

An operations, management, capacity, and services (OMCS) tool and method are presented for assessing business solutions comprising alternative network architectures and management processes for a telecommunications network. The OMCS tool comprises modules for selecting, engineering, and costing plurality of network architectures having various technologies and management processes for the business solutions. The management processes create and establish management networks for managing the plurality of network architectures. The OMCS tool further comprises modules for determining, storing, and displaying business parameters for the business solutions. The business parameters comprise capital expenditure (CAPEX), operational expenditure (OPEX), total expenditure, revenue, capacity, return on investment (ROI), and other business and financial statistics. The OMCS tool and method determine the business solution for an owned, a leased, or partially

owned and leased telecommunications network. The business solution comprises network architecture having network elements (NEs), customer premise equipment (CPE), and links from the same or different equipment suppliers; and management networks for managing the network architecture having network, service, and  
5 customer management processes from the same or different management processes suppliers.